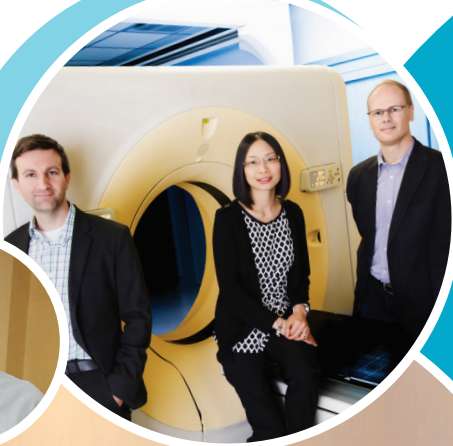
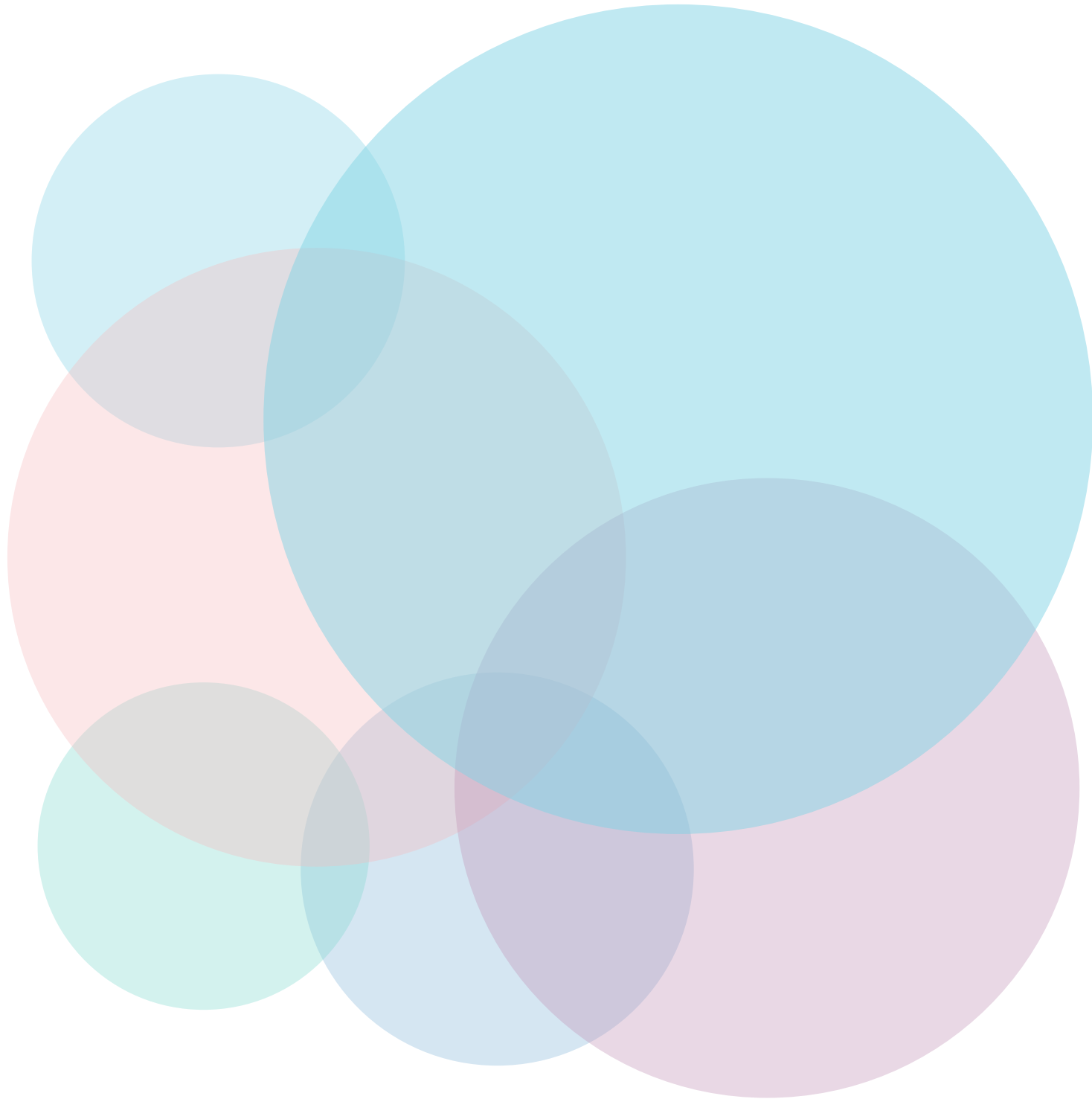


2018-2019 Annual Report Radiation Medicine Program





Contents

- 5** A Message from the Chief
- 6** Program Overview
- 7** The Year in Numbers
- 8** Strategic Roadmap to 2020: A Year in Review
- 10** Clinical Care
- 13** Quality & Safety
- 16** Education
- 20** Research
- 24** People

A Message From The Chief



The Radiation Medicine Program (RMP) at the Princess Margaret Cancer Centre is committed to delivering the highest standard of patient care. Over the past year, our dynamic and collaborative multi-disciplinary team of radiation oncologists, medical physicists, radiation therapists, administrators, researchers, and educators, have advanced us toward our vision of “Precision Radiation Medicine. Personalized Care. Global Impact.” Our foundational values of innovation, excellence, collaboration, accountability, and integrity have all played a pivotal role in our mission to provide exemplary radiation medicine through patient care, research, and education in partnership with our patients and community.

2018 brings us another year closer to the culmination of our **Strategic Roadmap to 2020**. As a program, we have made remarkable progress, and I would like to highlight a few specific accomplishments. First and foremost, we successfully completed a Canadian Nuclear Safety Commission Audit. Our robust quality and safety culture is a source of immense pride for RMP, and I would like to acknowledge the vigilant efforts of all staff and leadership in this regard. Another keystone RMP accomplishment in 2018 was the world’s largest deployment of the RayStation Treatment Planning System. This highly coordinated collaborative effort means treatment plans can be developed faster and more efficiently, allowing care to be delivered to our patients as precisely and rapidly as possible. It is also important to acknowledge that we remain the largest single-site radiation medicine program in the world, having provided 9,113 patient consultations and 11,099 courses of radiation treatment in 2018, recording the highest number of courses delivered in the our history.

Our research program has continued to expand and thrive, and is centered on six strategic priority areas including radiogenomics, radiomics, MR-guided radiation therapy, oligoprogression, regenerative radiation medicine, and patient-reported outcomes. 2018 saw the establishment of the Radiomics for Radiotherapy Research (R3) Consortium. RMP also hosted the first-ever Ontario Proton Therapy Symposium in 2018, situating RMP as a leading advocate for the implementation of this important treatment option for cancer patients in Ontario. Our continued excellence and innovation in education was also demonstrated in 2018. The international reputation of the Accelerated Education Program (AEP) continues to attract attendees from around the world to its high-impact, industry-leading courses. As one headline example, AEP’s 52nd course, “Expanding Use of SBRT in Radiation Therapy” welcomed 28 participants from several different countries, with 100% of course participants reporting that the course met its objectives. In training such a diverse group of radiation medicine professionals, we are delivering on our plan to truly have a global impact, maximizing positive outcomes for not just our own patients, but for those around the world.

In summary, I am thrilled to be able to share so many program accomplishments from 2018. We remain steadfast in our dedication to accelerate discovery to deliver precision radiation medicine, integrate research and education with clinical practice, strengthen internal and external community linkages, and extend high reliability with systems thinking for 2019. I eagerly anticipate all that we can achieve together in the coming year.



Fei-Fei Liu, MD, FRCPC
Chief, Radiation Medicine Program, Princess Margaret Cancer Centre
Head, Department of Radiation Oncology, University Health Network



The Radiation Medicine Program (RMP) at the Princess Margaret Cancer Centre is the largest radiation treatment centre in Canada, and one of international acclaim. The program is organized into the three core disciplines of radiation oncology, medical physics and radiation therapy; each supported by robust clinical, research, administrative and technical teams. Together, this multi-professional group of over 400 staff work collectively to deliver high quality and safe radiation treatment to over 9000 cancer patients every year.

RMP has a diverse pool of talent, with many staff holding important leadership roles in patient-centred care, research and education at the local, national and international levels. Our research program, which spans from biological studies, translational biology and physics, clinical trials, to health services and education research, aims to innovate and advance radiation medicine practice, producing over 245 peer-reviewed publications annually.

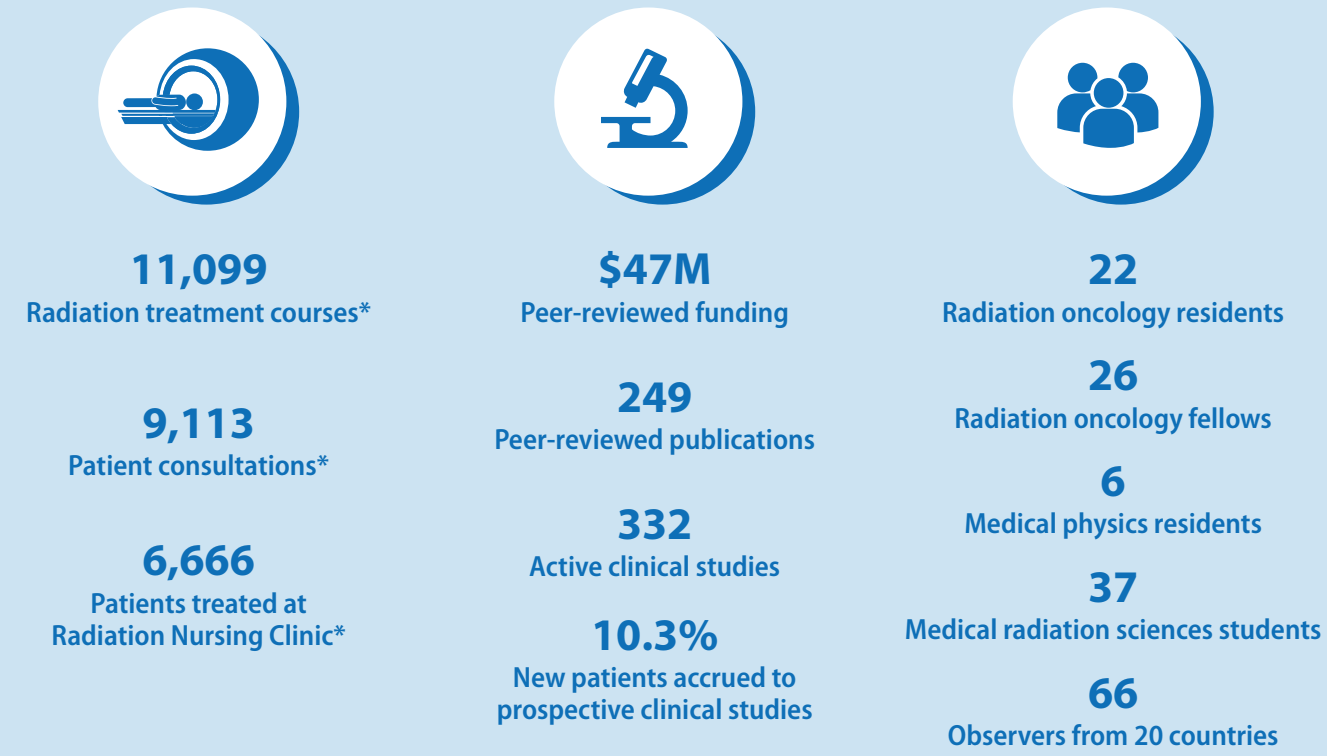
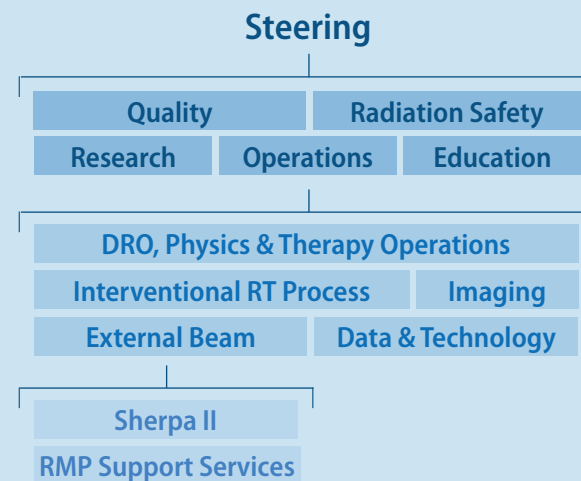
Our interdisciplinary environment facilitates the delivery of innovative education programs covering the complete spectrum of professional learning in radiation medicine. RMP offers training at the undergraduate, graduate and postgraduate levels in collaboration with the University of Toronto and Michener Institute of Education at UHN, as well as continuing medical education through our Observership and Accelerated Education Program (AEP).

Program Overview

State of the Art Facility

- 16** Linear accelerators
- 2** Leksell Gamma Knife Perfexion units
- 1** MR-Linac
- 1** PET CT simulator
- 1** MRI 3T simulator
- 3** CT simulators
- 1** Orthovoltage unit
- 2** Brachytherapy high dose rate (HDR) remote afterloaders
- 1** Magnetic resonance-guided radiation therapy (MRgRT) facility

Program Structure

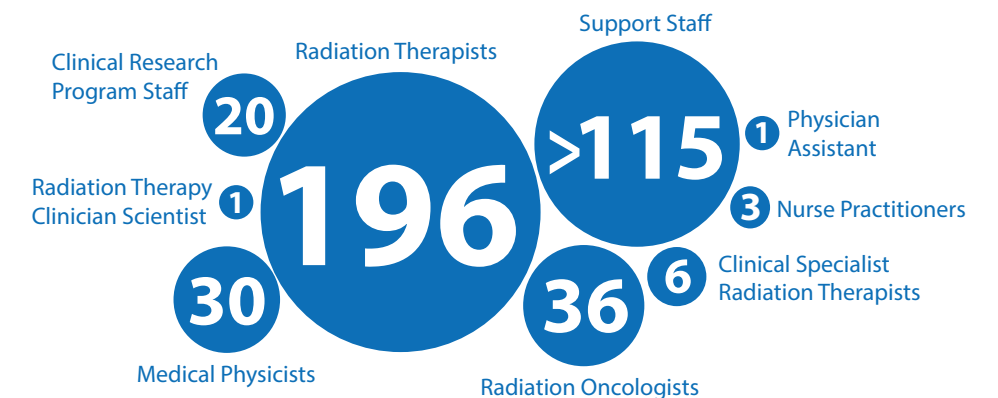


2018 the year in numbers

**fiscal year statistics*

Team RMP

Our multi-talented, interprofessional staff enables all aspects of our program to succeed. Led by the Program Chief, the RMP Steering Committee defines the principles of operation, and policies of governance for the management of clinical, quality assurance and safety, research, educational, operational and IT activities.



Precision Radiation Medicine. Personalized Care. Global Impact.

Since the launch of the **Strategic Roadmap to 2020** in 2015, RMP has focused on implementing several key initiatives and activities to help achieve its four strategic priorities to: 1) accelerate discovery to deliver precision medicine for best patient and population outcomes; 2) integrate research and education with clinical practice; 3) strengthen internal and external community linkages; and 4) extend high reliability with systems thinking. Key highlights from 2018-2019 are shown.

Accelerate discovery to deliver precision medicine

- Hosted the first-ever Ontario Proton Therapy Symposium in collaboration with U of T, SickKids, POGO
- Migrated all external beam planning techniques to RayStation, marking the world's largest RayStation deployment
- Rolled out Radiation Therapist Case Expert practice model with RT Site Leads training in CT Sim and Treatment Planning
- Developed harmonized process for overseeing MR-guided adaptive RT in RMP, including new technology implementation, protocol development/approval & optimal clinical/academic utilization to ensure impact
- Improved reliability of MRgRT facility and implemented real-time MR-imaging of patients receiving EBRT

A Year in Review

Strategic Roadmap to 2020

Strengthen internal & external community linkages

- Hosted a continuing education event with referring physicians from St. Michael's, St. Joseph's, Humber River Hospitals
- Completed SharePoint CMS upgrade pilot project in collaboration with UHN Digital
- Established cross-appointed radiation oncologists and collaborative, multidisciplinary oligo-metastases brain clinic with Stronach, and Carlo Fidani Regional Cancer Centres
- Developed Safety Huddle Database for staff to submit and track opportunities for improvement
- Promoted interdisciplinary leadership and broad programmatic engagement in the international MR LINAC Consortium

Integrate research & education with clinical practice

- Secured funding from Harrison McCain Foundation and Elekta China to develop collaborative professional training opportunities in Atlantic Canada and China
- Held 1-day Faculty Development Workshop on Competence by Design in Radiation Oncology
- Launched RMP Research Bites, a quarterly e-newsletter highlighting RMP research activities and achievements
- Successfully launched a new Image Guidance for Radiation Therapists AEP Course to build image-matching competence for therapists
- Increased utilization of social media to disseminate information regarding RMP research accomplishments

Extend high reliability with systems thinking

- Deployed EVOQ in the Breast Site Group
- Developed a dashboard of key research metrics for near real-time reporting and program planning
- Established a formalized collaboration with the Princess Margaret Biostatistics Department to improve efficiency
- Recruited Scientific Program Manager to increase external peer-review funding

Outstanding Innovation in Clinical Care

RMP received two TCLHIN Certificates of Recognition in the category of Outstanding Innovation for its QuickStart Program and E-Consent System. The QuickStart Program at the Princess Margaret offers women with early-stage breast cancer expedited treatment planning and delivery for their first radiation treatment within one day. E-Consent is a paper-less, password-protected electronic documentation system for the consent-to-treatment process. Implementation of e-Consent within the program has drastically improved efficiency by reducing the time spent faxing and scanning, as well as avoiding consent-related errors.



QuickStart Team: Thomas Purdie, Grace Lee, Anthony Fyles (Missing: Anne Koch)



eConsent Team: Terry Michaelson, Mazaheer Bana, Jerry Roussos, Veng Chhin

Our clinical practice encompasses all aspects of cancer care – from diagnosis to survivorship. In 2018-2019, RMP provided 9,113 patient consultations and delivered 11,099 courses of radiation treatment, with 82% of new patient consultations being conducted within the 14-day target established by Cancer Care Ontario (CCO). There were 6,666 visits to the Radiation Nursing Clinic (RNC) for symptom and side-effect management.

Our clinical practice is integrated into four multi-disciplinary Super Teams comprised of anatomically-related tumour site groups. Standardized treatment protocols that relate to evidence-based disease management guidelines are used by each site group to plan and treat patients.

In addition to site groups, a number of specialized programs exist to further support individualized care in a subset of patients. Together, our interprofessional team works collaboratively to assess, plan and deliver personalized care to our patients.

Clinical Teams

| Superteams | Tumour Site Groups |
|------------|---|
| Team 1 | Endocrine, eye, head & neck, skin |
| Team 2 | Breast, lung, upper gastrointestinal (GI) |
| Team 3 | Genitourinary (GU), gynecological (GYN), lower GI |
| Team 4 | Central nervous system (CNS), leukemia, lymphoma, palliative, pediatrics, sarcoma |

Specialized Programs

| | |
|--------------------------|--------------------------------|
| Brachytherapy | Palliative Radiation Oncology |
| Gamma Knife Radiosurgery | Pediatric Radiation Therapy |
| Oligometastases | Stereotactic Radiation Therapy |

Clinical Care

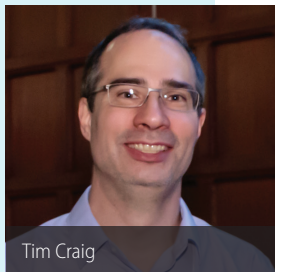
A Vision for Proton Therapy in Ontario

In November 2018, RMP hosted the first-ever Ontario Proton Therapy Symposium, entitled “A Vision for Proton Therapy in Ontario”, in collaboration with the University of Toronto, Hospital for Sick Children, and the Pediatric Oncology Group of Ontario. The symposium, co-chaired by **Derek Tsang** and **David Jaffray**, aimed to increase awareness of proton therapy and facilitate access to this important treatment option for cancer patients across Ontario. Hospital leaders, government administrators, and health care providers from MOHLTC, CCO, UHN, SickKids, POGO, and nine cancer centres across Ontario attended the well-received event.



World's Largest RayStation Installation

RMP completed its clinical transition to RayStation for external beam treatment planning in 2019, marking the largest RayStation installation in the world. Led by **Tim Craig**, over 7000 clinical RayStation plans were produced; standardized planning nomenclature was adopted across the program; 56 RayStation planning protocols were written, tested, measured, reviewed and approved; 11 step-and-shoot IMRT techniques were migrated to VMAT; electron planning was completely re-designed; and palliative planning processes were dramatically improved. RMP now has a platform that can support current state-of-the-art and future planning activities, including dose reconstruction, adaptive radiation therapy, and proton therapy. RMP is an acknowledged leader at the Princess Margaret and UHN in technology adoption due to **David Jaffray's** vision and ongoing efforts to ensure RMP remains ahead of the curve in bringing new technologies to improve patient care.



Tim Craig

Mobilizing to Support Personalized Precision Radiation Medicine

The Case Expert Radiation Therapist practice model is currently being rolled out within RMP to enable radiation therapists to deliver adaptive radiation therapy and person-centered care. Led by **Elen Moyo**, the innovative model envisions a primary radiation therapist, who functions within the multidisciplinary radiation team, but is engaged in all aspects of the patient's journey, serving as a continuous advocate and steward for the patient through patient education, CT simulation, planning, treatment delivery, patient care and symptom management. After successful pilot studies in 2 Super Teams, phase 2 of the initiative commenced in November 2018 with skilling up of RT Site Leads in CT simulation and treatment planning for all 4 Super Teams.



Colleen Dickie was appointed as the Director of Operations of RMP, effective April 2018, succeeding Sophie Foxcroft, who held this position since 2013



John Kim assumed the role of the Deputy Chief of RMP in April 2018



Fei-Fei Liu was appointed as the Chair of the Medical Advisory Committee at UHN in January 2018

Leadership Appointments

Jean-Pierre Bissonnette: Associate Head of Professional and Academic Affairs for the Department of Medical Physics (May 2018)

Carina Feuz: Interim Radiation Therapy Team 3 Supervisor (May 2018)

Kathy Han: DRO Gynecology Site Group Leader (February 2019); succeeding Michael Milosevic, who held this position for well over 20 years

Christine Hill: Manager of Radiation Therapy Strategic Operations (July 2018)

Nareesa Ishmail: Radiation Therapy Team 3 Supervisor (September 2018)

Normand Laperriere: Interim Princess Margaret CNS Site Group Leader (February 2018)

Winnie Li: Interim Process Development and Integration Practice Leader – Radiation Treatment Delivery (March 2018)

Fei-Fei Liu: Re-appointed as Chief of RMP at the Princess Margaret for another 5-year term (April 2018)

Quality & Safety

The RMP Quality Committee (RMP QC) functions to monitor, analyze, report and make recommendations on all aspects of radiation treatment quality and safety within RMP. Reporting to the RMP Steering Committee and Princess Margaret Quality Committee, the RMP QC aims to exceed national and international safety standards and oversees a quality monitoring program for the department covering the following four domains:

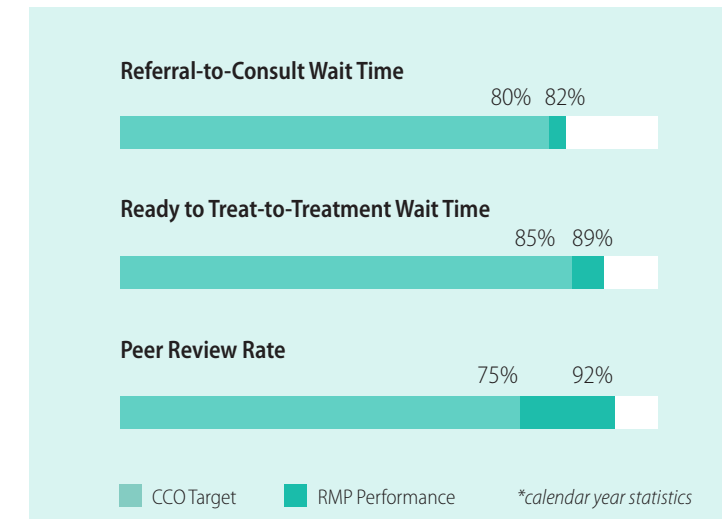
- 1. Performance Indicators**, aimed at evaluating compliance with relevant standards
- 2. Quality Assurance**, aimed at monitoring radiation treatment quality control processes
- 3. Quality Education**, aimed at contributing to quality and safety competence through education
- 4. Incident Learning**, aimed at managing an incident learning system

Excellence in Performance

The RMP QC uses the standards set by Cancer Care Ontario, Canadian Partnership for Quality Radiotherapy (CPQR) and Accreditation Canada to provide guidance in developing and maintaining quality in the program.

CCO Performance Measures

CCO monitors 3 key performance areas: referral-to-consult wait times, ready to treat-to-treatment start wait times, and peer review rates. RMP continued to meet or exceed the majority of the CCO Performance Measures and provincial averages for wait times and peer review in 2018.



CPQR Program Compliance

CPQR has published a series of 16 guidelines in 3 categories: technical quality control, quality assurance and patient engagement. Compliance has been assessed against all of the CPQR guidelines; three have been deemed not applicable to RMP practice. In 2018, RMP had a compliance rate of 94%.

Accreditation Canada Standards

Accreditation Canada introduced 32 new radiation therapy specific standards to the Qmentum Program in 2017. In anticipation of UHN accreditation in September 2019, the RMP QC has completed a review of the radiation standards in order to assess and address areas of non-compliance. All radiotherapy standards are deemed in compliance with one requiring further review.



Jean-Pierre Bissonnette was appointed as the Physics Clinical Quality Lead with the Radiation Treatment Program at CCO in January 2018.

Quality & Safety

Acumyn Inc. Acquired by Elekta

AQUA™, a clinical Quality Assurance software platform developed by a multi-disciplinary team led by **Daniel Letourneau** and **David Jaffray** was acquired by Elekta in September 2018. Commercialized through the spin-off company, Acumyn Inc., this acquisition will help bring AQUA's quality management to the world and provides an effective tool to facilitate the delivery of safe radiotherapy for our cancer patients.



Kevin Wang, Jim Pearce, Daniel Létourneau, David Jaffray, Matthew Bergshoeff, Varsha Devulapalli

CNSC Audit Successfully Completed

RMP successfully completed its Canadian Nuclear Safety Commission (CNSC) Type I audit in September 2018. With the CNSC audit taking place once every 5 years, this is a critically important milestone for RMP. The program is grateful for everyone's immense efforts in preparation for this review, and participating in all the interviews with the auditors. In particular, RMP is deeply appreciative of the tremendous support and guidance from our UHN Radiation Safety Team. Much of the success behind this audit is due to the continuous rigour and attention by our medical physics and radiation therapy teams, brachytherapy and ocular oncologists, as well as members of our Radiation Therapy Radiation Safety Committee. Inasmuch as this CNSC audit is a single event in the life of RMP/UHN, the positive review highlighted our strong culture of safety, the collaboration within our teams, the safety huddles, and leadership's attention and response to concerns raised from our front-line staff.

RMP Wins UHN Local Impact Award

The Radiation Therapy Workplace Violence Implementation Group, comprised of **Andrea Shessel, Gary Chaulk, Anne Di Tomasso, Colleen Dickie, Devin Hindle, Annette Sperduti** and **Hina Akmal**, was selected as recipients of the 2018 UHN Local Impact Award – Non-Clinical Team, for identifying a process of dealing with patients or family members who may present safety concerns that could result in incidents of workplace violence. This Award was presented to the group during the Annual General Meeting of the UHN Board of Directors in June 2018.



Andrea Shessel, Gary Chaulk, Anne Di Tomasso, Colleen Dickie, Devin Hindle, Annette Sperduti, Hina Akmal



Fei-Fei Liu, Dave Niven, John Waldron



UHN Radiation Safety: Perry Chong, Valerie Phelan, Raina Park, Frank Tourneur, Carmelita Novielli, Neil Amos, Aaron Marshall, Gina Capone, Tracey Lui (Missing: Matthew Bernacci)

Education

As the largest single-site radiation medicine program in North America, RMP provides one of the most comprehensive clinical settings for the formal training of radiation oncologists, physicists and therapists. RMP's education portfolio is closely aligned with that of the University of Toronto's Department of Radiation Oncology as a fully affiliated teaching hospital of the University. This strategic alignment enables the optimal utilization of educational expertise and infrastructure, and facilitates the achievement of the central education mandate of RMP and UTDRO.

The formal professional training programs include: undergraduate training for radiation therapy (BSc Medical Radiation Sciences) and medical education; post-graduate training programs for radiation oncology residency, fellowship and physics residency; as well as the Master of Health Science in Medical Radiation Sciences (MHScMRS) graduate program and the Strategic Training in Transdisciplinary Radiation Science for the 21st Century (STARS21) training program. RMP staff also teach residents and fellows from other training programs, as well graduate students from University of Toronto Departments, such as the Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, Nursing, Institute of Medical Science, Institute of Biomaterials & Biomedical Engineering, and Medical Biophysics.

RMP offers interdisciplinary continuing education catered to practicing radiation medicine professionals, who seek to gain informal or structured learning experiences at the Princess Margaret, including the RMP Observership Program; the Accelerated Education Program, which delivers in-depth structured 2-3 day courses; and the Personalized Learning Program™ (PLP™) in Radiation Medicine, which offers 3-6 months of on-site and online learning opportunities.

Excellence in Teaching

Jennifer Croke received the inaugural University of Toronto MD Program Teaching Award of Excellence for the 2017-2018 academic year. The new award introduced by U of T medical students recognizes faculty in the MD Program who have attained Teaching Evaluation Scores in the top 10% in one or more of the teaching activities to which they have contributed. Jennifer was also the recipient of one of two 2019 PARO Excellence in Clinical Teaching Awards allocated to U of T. She is only one of three radiation oncologists to have received this prestigious award – another being our own **Andrew Bayley** in 2002.



Jennifer Croke, Glen Bandiera

Diverse Learners

Undergraduate

- 37 BSc Medical Radiation Sciences students
- 61 Undergraduate Medical Education students
- 1 CARO-CROF student
- 25 Summer students

Post-Graduate

- 22 Radiation oncology residents
- 26 Radiation oncology fellows
- 6 Medical physics residents
- 3 Strategic Training in Transdisciplinary Radiation Science for the 21st Century scholars

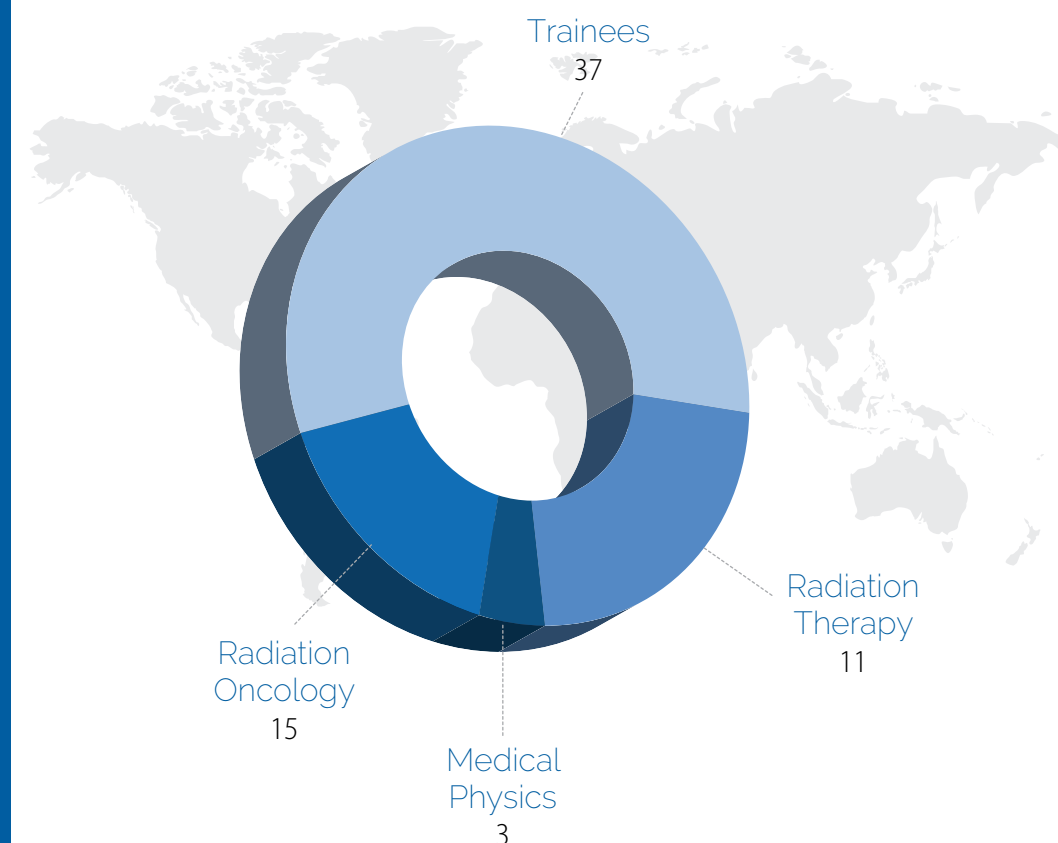
Continuing Education

- 66 Observers from 20 countries
- 31 AEP external participants (3 on-site AEP Courses)
- 1 Personalized Learning Program participant

**Academic year statistics*

Building Global Capacity in Radiation Medicine

As global leaders in clinical practice, research and education, RMP actively disseminates its knowledge and best practices so that quality care can be available to all patients within our community and globally. In 2018-2019, RMP hosted 66 observers from 20 countries. Observers spent a median of 10 days (range: 1-67) at RMP, and included health professionals from radiation oncology (23%), medical physics (4%), radiation therapy (17%), as well as trainees (56%). RMP continued discussions with our global partners in Africa, Jamaica, United Kingdom, Hong Kong and China on strategies to leverage radiation and educational expertise to enhance global capacity within radiation medicine.



RMP Attracts Major Following in China

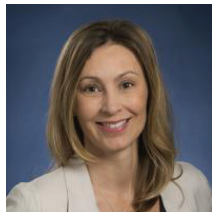
As part of RMP's ongoing partnership with the University of Hong Kong-Shenzhen Hospital (HKU-SZH), the Sanming Project of Medicine's 2nd International Symposium on Specialist Education and Advances in Radiation Oncology took place during November/December 2018 in Shenzhen, China. Featuring Princess Margaret's **Fei-Fei Liu, Brian O'Sullivan, Laura Dawson, Rebecca Wong, Sophie Huang** and **Marnie Escaf**, RMP solidified its reputation as one of the leading radiation medicine programs in the world, contributing invited presentations, exercises, and workshops for a wide array of international attendees. The Contour Workshop led by the RMP team had 90 on-site participants from across China (e.g. Liaoning, Zhejiang, Fujian, Chongqing, Hubei) and >8000 "registrants" through the webcast. Talks from our RMP team garnered thousands of hits online, reaching over 65,000 views. RMP deeply values its international partnerships and hopes that this symposium and continued global outreach collaborations will translate to improved patient outcomes and the advancement of medical research in China and around the world.



Brian O'Sullivan, Laura Dawson, Anne Lee, Rebecca Wong



Leadership Appointments



Marianne Koritzinsky: Rank of Associate Professor at UTDRO (July 2018)



Jennifer Croke: Associate Director of the UTDRO Fellowship Program (October 2018)



RMP Welcomes Summer Students

RMP welcomed 25 new students to its 2018 RMP Summer Student Program, which facilitates the progression of many research projects across all disciplines within RMP, while providing a valuable workplace experience for students. Over the summer, students had the opportunity to participate in the U of T Department of Medical Biophysics Summer Series and the Princess Margaret Cancer Program Summer Learning Series. Three RMP students were recognized with awards at the PM Summer Student Research Day.

RMP Partners with Hong Kong Health Authority

The Accelerated Education Program (www.aepeducation.ca) at the Princess Margaret formalized a partnership with the Hong Kong Hospital Health Authority for the annual advanced training of four expert radiation therapists. This included the development of a new "Image Guidance for Radiation Therapists" course aimed at building image-matching competence for radiation therapists. The inaugural course, led by Course Director, **Winnie Li**, was held in January 2019 with huge success. Dynamic, practical presentations from RMP's amazing faculty highlighted best practices from the front lines and immersed our learners in the wild and wonderful world of volumetric image matching. The audience comprised of eight learners from across Canada (New Brunswick, Newfoundland & Labrador, Saskatchewan, Ontario) and the four radiation therapists from Hong Kong, who were also on a 2-week Observership at RMP. Participant feedback highlighted the value of the immersive, case-based approach that was used to build competence.



Radiation therapists from Hong Kong: Man Hui, Sharon Wong, Jessica Kong, Dragon Liu

Research

RMP is a world-leader in radiation research aimed at developing more precise, personalized solutions that will cure more patients with fewer side effects. Our research program spans the breadth of the four professional disciplines of radiation oncology, medical physics, radiation therapy and radiation nursing, and is led by nationally and internationally recognized experts. The program encompasses the full spectrum of radiation research from basic biologic studies through translation biology and physics to clinical trials, health services and education research.



RMP is disrupting the radiation treatment landscape through new Adaptive Radiation Oncology research and knowledge dissemination to ensure the right treatment at the right time for every patient. The program is accomplishing this through innovative approaches that integrate clinical care and research, learning from all of our patients while focusing on the outcomes that matter most to patients along their cancer journey.

RMP research activities are strategically focused on six key domains to accelerate the availability of adaptive radiation oncology for every patient:

1. Radiogenomics
2. Radiomics
3. MR-guided radiotherapy
4. Oligoprogression
5. Regenerative radiation medicine
6. Patient-reported outcomes

These research themes are highly integrated and closely aligned with the research objectives of the Princess Margaret, UHN and University of Toronto's Department of Radiation Oncology. There is strong collaboration with other academic and industry-based research groups within UHN, as well as external groups locally, nationally and internationally and internationally.

Leadership Appointments

Renise Ayeerst: CRP Research Manager (April 2019)

Jim Dimitroulakos: RMP Scientific Program Manager (June 2018)

Lea Dungao: CRP Quality Assurance and Monitoring Lead (April 2018)

Benjamin Haibe-Kains: Scientific Lead of the RMP Radiomics Program (January 2018)

Bernadeth Lao: CRP Team Lead (November 2018); Interim CRP Research Manager (December 2018)



\$47M
peer-reviewed
funding

\$1M
industry funding



137
peer-reviewed
grants



249
peer-reviewed
publications



332
active clinical
studies



173
prospective clinical
research studies



10.3%
new patients accrued
to prospective clinical
research studies

**calendar year statistics*

Novel Discoveries



New Therapeutic Opportunities for Combatting Cancer Progression

Scott Bratman and colleagues demonstrated that plasma redox imbalance caused by albumin oxidation promotes lung-predominant NETosis and pulmonary cancer metastasis.ⁱ Published in *Nature Communications*, these findings provide new therapeutic and diagnostic opportunities for combatting cancer progression.



Circulating HPV DNA as a Response Biomarker for Cervical Cancer

Kathy Han, Scott Bratman and colleagues reported that detectable plasma HPV DNA at the end of chemoradiation therapy predates the clinical diagnosis of metastases and is associated with inferior progression-free survival.ⁱⁱ Published in *JCO Precision Oncology*, these findings suggest the clinical utility of plasma HPV DNA detection for guiding adjuvant/salvage therapy.

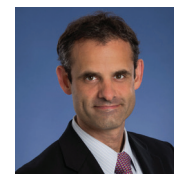
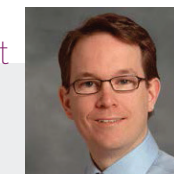
Impact of the Clinical Specialist Radiation Therapist Role

Nicole Harnett and **Padraig Warde** demonstrated that the Clinical Specialist Radiation Therapist, a new advanced practice role for radiation therapists, positively impacts quantity (capacity of the system), quality, research and innovation at Canadian cancer centres.ⁱⁱⁱ



New QC Method for Linac Radiation and Mechanical Axes Alignment

A team led by **Daniel Letourneau** and **David Jaffray** developed a new automated QC test suite to assess linear accelerator radiation and mechanical axes alignment, which reduces complexity with improved efficiency.^{iv}



Efficacy of Stereotactic Radiosurgery for Brain Metastases

David Shultz and colleagues reported that stereotactic radiosurgery (SRS) is safe/effective for the treatment of ≤ 2 cm brain metastases.^v Published in *Neuro-Oncology*, the study demonstrated that for brain metastases treated with SRS, lesion size and prescribed dose are correlated with rates of local failure and radionecrosis.



Reducing Radiation-Induced Skin Fibrosis in Cancer Patients

A study led by **Fei-Fei Liu** explored the effects of metabolism on the development of skin fibrosis, and ways of overcoming this with new drugs that target specific metabolic pathways in pre-clinical models.^{vi} The findings, published in *Nature Metabolism*, could have important implications for the management of radiation-induced fibrosis in patients.

Excellence in Cancer Research



Fei-Fei Liu was appointed as the inaugural Peter and Shelagh Godsoe Chair in Radiation Medicine at the Princess Margaret in March 2019. This Endowed Chair is a prestigious joint hospital and University of Toronto Chair aimed at supporting the activities of the Chief of Radiation Medicine Program.



John Waldron was appointed as the Bartley-Smith Wharton Chair in Radiation Oncology in January 2019 for a 5-year term. John has led RMP's Head and Neck Site Group since 2006, and assumed leadership of the PM Head and Neck Group in 2016, which is known as a world-class multi-disciplinary program delivering excellence in clinical care, education, and research.

Notable Peer-Reviewed Funding

Alejandro Berlin: Combination of Subpathology and Noncoding RNA: Integrating Outcome Prediction and Treatment Individualization for Intermediate-Risk Prostate Cancer. Prostate Cancer Canada Translation Acceleration Grant

Alejandro Berlin: Subpathologies and Genomic Classifier for Individualized Post-Prostatectomy Radiotherapy. ESTRO-Varian Research Award

Alejandro Berlin and **Thomas Purdie:** Prospective Validation of a Novel-Voxel- and Machine Learning-based Automated Planning Method for Prostate Fossa Volumetric Arc Radiotherapy. CARO SANOFI Award

Scott Bratman: Genomics-based Radiosensitization for HPV-Negative Squamous Cell Carcinoma of the Aerodigestive Tract. V Scholar Program Grant, V Foundation for Cancer Research

Scott Bratman, John Waldron and **Benjamin Haibe-Kains:** A Phase II Single Arm Trial of Elective Volume Adjusted De-Escalation Radiotherapy (EVADER) in Patients with Low-Risk HPV-Related Oropharyngeal Squamous Cell Carcinoma. CIHR Project Grant

Peter Chung: Feasibility and Toxicity of mp-MRI guided Focal SABR with or without Whole Gland SABR for Patients with Localized Prostate Cancer. CARO SANOFI Award

Kathy Han and **Scott Bratman:** Circulating HPV DNA as a Biomarker of Response in Patients with Locally Advanced Cervical Cancer Treated with Definitive Chemoradiation. Cancer Research Society Operating Grant

Benjamin Lok: Development of Epigenetic Therapeutics for Small Cell Lung Cancer. IASLC Young Investigator Award

Jolie Ringash: Efficacy of the Rehabilitation Planning Consult for Survivors of Head & Neck Cancer: A Phase II Randomized Controlled Trial. Canadian Cancer Society Innovation to Impact Grant

Alexandra Rink: A Universal Self-Calibrating *in vivo* Real-Time Optical Radiation Dosimeter for Quality Assurance and Quality Control of Radiotherapy Treatment. CIHR Project Grant

David Shultz: Measuring and Molecularly Defining Intra-Tumoral Hypoxia Using FAZAPET/MRI and Pimonidazole in High-Risk Sarcoma. RSNA Research Seed Grant

Teo Stanescu: An AI-Driven Approach for MRI-Guided Radiotherapy. AbbVie CARO Uro-Oncologic Radiation Award (ACURA)

Alex Vitkin: Wide-field Polarimetric Imaging for Targeted and Rapid High-Sensitivity Analysis of Breast Cancer Margins and Heterogeneity with Mass Spectrometry. CIHR Project Grant

Notable Awards and Distinctions

Alejandro Berlin: UTDRO Rising Star Research Award

Scott Bratman: ASTRO Basic/Translational Science Award for his project entitled "Plasma Redox Imbalance Caused by Albumin Oxidation Promotes Lung-Predominant NETosis and Metastasis in Patients Treated With Definitive Radiotherapy"

David Jaffray and **Monique van Prooijen:** Michael S. Patterson Publication Impact Prize in Medical Physics for their paper entitled "Gold Nanoparticles as Radiation Sensitizers in Cancer Therapy"

Normand Laperriere: Princess Margaret Till and McCulloch Clinical Paper of the Year Award for his paper entitled "Short-Course Radiation plus Temozolomide in Elderly Patients with Glioblastoma"

Benjamin Lok: Appointed as Ontario Association of Radiation Oncologists Clinical Scientist



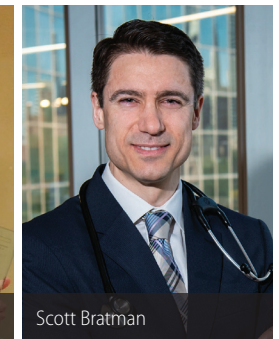
Michael Milosevic, Alejandro Berlin, Fei-Fei Liu



Michelle Hiltz, Monique van Prooijen, David Jaffray



Normand Laperriere



Scott Bratman



Benjamin Lok

RMP Represents at CARO-COMP-CAMRT



Laura Dawson

RMP was well-represented at the first Joint Scientific Meeting hosted by the three sister organizations, Canadian Association of Radiation Oncology (CARO), Canadian Organization of Medical Physicists (COMP), and Canadian Association of Medical Radiation Technologists (CAMRT) in September 2018. RMP staff and trainees presented and/or moderated various sessions/workshops throughout the conference; several of whom were recipients of awards.

- **Laura Dawson** delivered the Gordon Richards Lecture, introduced by Mary Gospodarowicz. Her presentation was entitled "Person-Centered Liver Cancer SBRT"
- **Teo Stanescu** received the Best Abstract in Science and Applied Technology Award for "Deep Neural Network for MR to CT imaging Translation Applied to H&N Data"
- **Anet Julius** received an Associate Member Awards – Nursing for "Exploring the Educational Needs of Women with Gynecological Cancers Post-Brachytherapy"

People

With a team of over 400 radiation specialists, the Radiation Medicine Program is fortunate to have a diverse pool of talent to increase RMP's capacity to deliver on its vision to achieve "Precision Radiation Medicine. Personalized Care. Global Impact." In 2018, RMP continued to exhibit excellence, innovation and leadership in patient-centred care, research and education, exemplified by the high level of productivity and achievements of our staff.



Princess Margaret Long Service Award Recipients (years of service): Christine Hill (10), Andrew Lieu (10), Harald Keller (10), Nancy LaMacchia (25), Angela Cashell (30), Ivan Yeung (25), Mary Ashok (10), Samuel Appiah (10), Winnie Li (10)



Jennifer Deering was awarded the Pfizer Award of Excellence in Nursing Clinical Practice at the 30th Annual Canadian Association of Nurses in Oncology Conference



Maitry Patel was awarded the 2018 Honour Roll from the Canadian Association of Physician Assistants for her outstanding contributions to the promotion and development of the Physician Assistants profession



Danielle Rodin was elected to the 2018-2020 UICC Board of Directors, effective October 2018

Mary Gospodarowicz was elected as one of nine inaugural board members of the UICC C/Can 2025: City Cancer Challenge in September 2018, a multi-sectoral initiative supporting cities to take the lead in the design, planning and implementation of cancer treatment solutions.



David Jaffray was awarded the prestigious 2018 ASTRO Gold Medal by the American Society for Radiation Oncology. This award recognizes David as a revered member of the global radiation oncology community, acknowledging his outstanding contributions to the advancement of radiation medicine worldwide in the domains of research, clinical care, teaching and service.



Team RMP

New Talent

Radiation Oncology **Danielle Rodin**

Medical Physics **Jeff Winter**

Radiation Therapy **Angie Cardella, Jennifer Dang, Devin Hindle, Amanda Hogan, Julie Kang, Yilan Lu, Zabin Mawji, Lian Pablo, Erin Prisciak, Mohsin Qureshi, Alexandra Sarra, Louise Wei, Simon Xie**

Administration/Operations **Priyani Alahakoon, Zoraida Betancourt, Jeff Bruce, Lisa Chong, Vanessa De Concilys, Jim Dimitroulakos, Wendy Issa, Nahida Jafferli, Cheryl Marcelo, Jenny Vargas**

Clinical Research Program **Jessy Abed, Renise Ayearst, Rehab Chahin, Colleen Dunphy, Mahesh Kajil, Farah Khan, Masoud Mohammadi, Sarin Peres, Karen Tse**

Sustained Service

Congratulations and thank you to our dedicated RMP members who have reached their ≥25 year service milestone in 2018.

25 Years **Ivan Yeung, Nancy La Macchia, Emily Mettrick, John Waldron**

30 Years **Fei-Fei Liu, Kathleen Conway, Dan Sajac, Charles Catton, Richard Tsang, Angela Cashell**

RMP also congratulates staff who retired in the past year. Thank you for your many years of service.

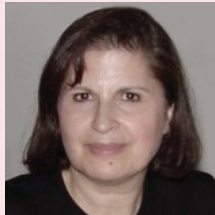
- **Hamideh Alasti** (33 years)
- **James Carpenter** (10 years)
- **Salma Jafferli** (28 years)
- **Wilfred Levin** (32 years)
- **Sandra Scott** (26 years)
- **Deborah Tsuji** (41 years)

Honouring a Lifetime of Achievement in Oncology



Wilfred Levin retired in April 2019, after serving as a radiation oncologist at RMP for 32 years. Since joining the department in 1988, he has assumed the role of Gynecology Site Group Leader from 1989-1992, and was an integral member of the Breast and PROP site groups. Most importantly, he co-founded Princess Margaret's Adult Radiation Late Effects Clinic (ARLEC) – the only one of its kind in Canada, in 2000. For almost two decades, ARLEC has helped hundreds of patients nationwide cope with radiation late effects. In recognition of the exceptional care he provides to our patients, Wilf received the Gerald Kirsh Humanitarian Award in 2008. RMP thanked and celebrated Wilf's contributions to RMP and the Princess Margaret at a farewell event in March 2019.

Honouring a Lifetime of Achievement in Physics



Hamideh Alasti retired in June 2018, after serving as a medical physicist at the Princess Margaret for over 33 years. Throughout her successful career, she has had a profound impact on the care received by our patients. Hamideh played a central physics leadership role in the establishment of the Prostate Marker IGRT Program, development of the 4D CT Program, re-building RMP's radiation safety approach over the past 10 years, and most recently, advancing our high-dose CT imaging initiative. These efforts will continue to have an enduring legacy even when she is enjoying her retirement with her husband, children and grandchildren. Hamideh's many contributions to RMP and the Princess Margaret were celebrated at a retirement event in June 2018.



Notable Awards and Distinctions

RMP Clinical Awards

- Exceptional Program Service: Physics Associates (**Nurul Amin, Makan Farrokhkish, Salomeh Jelveh, John Jezioranski, Shafi Kamal, Sunmo Kim, Bern Norrlinger, Yinkun Wang, Ting Jun Zhang, Tracey Williams**)
- Distinction in Quality & Process Improvement: **Alana Pellizzari**
- Distinction in Technical Improvement: RayStation Deployment Team (**Michael Holwell, Amy Parent, Alana Pellizzari, Tony Lam, Andrea McNiven, Patricia Lindsay, Harald Keller, Tim Craig, Alex Sun, John Waldron, Laura Dawson, Andrew Bayley**)
- Excellence in Patient Experience: Unit #3 Team (**Nettie Sperduti, Emily Mettrick, Carla Cerase, Jessica Bonomo, Ellen Hoffman, Maitry Patel**)

RMP Education Awards

- Chief's Choice RMP Rounds: **David Hodgson**
- Best RMP Rounds: Best of RTi3 (**Vickie Kong, Angela Cashell, Joanna Javor, Carina Feuz**)
- Trainee Excellence in Education: **Jenna Adleman, Pablo Munoz**
- Excellence in Education Support: **Angela Alivio**
- Distinction in Teaching: **Tim Craig**
- Distinction in Professional Mentorship: **Normand Laperriere**

Accelerated Education Program Awards

- Highest Overall Teaching Effectiveness Score: **Charles Catton**
- Putting Innovation to Work: **Douglas Moseley**

RMP Research Awards

- Research Productivity – Radiation Oncology: **Alejandro Berlin, Peter Chung**
- Research Productivity – Medical Physics: **Thomas Purdie**
- Research Productivity – Radiation Therapy: **Vickie Kong**
- Most Influential Research Publication: **Normand Laperriere**
- Exceptional Research Support: CRP Regulatory Coordinators (**Sarah Lee, Janany Sivalingam, Matthew Ramotar, Brian Lofgren, Katrina Rey-McIntyre, Devin Hindle**)
- Research Leadership: **James Brierley**
- Top Clinical Trial Accrual Investigator: **Andrew Hope, Jennifer Croke**

Notable Awards and Distinctions

Charles Catton: Ontario Medical Association Life Membership Award

Sophie Huang: CAMRT Welch Memorial Lecturer Award

Benjamin Lok: ASCO Conquer Cancer Foundation Career Development Award

Michael Velec: CAMRT Early Professional Achievement Award

UHN Award Winners

Meredith Giuliani (Cancer Answers Development Team Member): Princess Margaret Innovation in Education Award

Emma Ito and **Maitry Patel:** Princess Margaret Excellence in Education Support Award

Andrea McNiven and **Monique van Prooijen:** Princess Margaret Outstanding Contribution to Cancer Education Award

Natassia Naccarato and **Alice Leung:** Princess Margaret Employee Engagement – Team Engaged Spirit Award



Charles Catton



Fabio Moraes, Monique van Prooijen, Emma Ito, Maitry Patel, Laurence Lee



Natassia Naccarato, Alice Leung, Marnie Escaf



Mary Gospodarowicz, David Jaffray, Brian Kavanagh



Vickie Kong, Carina Feuz, Joanna Javor, Angela Cashell, Rebecca Wong



Sarah Lee, Janany Sivalingam, Michael Milosevic



Tracey Williams, Colleen Dickie



Angela Alivio, Rebecca Wong



Douglas Moseley, Nicole Harnett



Alexander Sun, Harald Keller, Michael Holwell, Alana Pellizzari, John Waldron, Andrea McNiven, Patricia Lindsay, Tony Lam, Colleen Dickie



Matthew Ramotar, Michael Milosevic

Tribute

Celebrating the Career of a Leader in Physics

Over the past two decades, **David Jaffray** has been an invaluable member of the RMP and UHN team. He has been a visionary leader as the Head of Medical Physics at the Princess Margaret, Executive Vice President of Technology and Innovation at UHN, and Director of the Techna Institute. His contributions to the field of imaging technologies, specifically, the development and application of image-guided radiation therapy, have made an incredible impact on advancing cancer research and clinical care. Notable achievements include, but are not limited to:



- Established the state-of-the-art Magnetic Resonance-guided Radiation Therapy (MRgRT) facility at the Princess Margaret, the first of its kind in the world
- Developed the Elekta Gamma Knife Icon in partnership with Elekta and Techna researchers
- Co-Founded Acumyn Inc. with Daniel Letourneau; developed the AQUA quality assurance management software, which has been commercialized by Elekta
- Co-Invented the X-RAD 225Cx with Richard Hill – a pre-clinical image guided x-ray irradiation system
- Co-Founded Nanovista Inc., which provides multimodal visualization agents designed specifically to enhance the performance of image-guided interventions such as surgery, radiotherapy and drug delivery
- Co-Invented the Radiation Therapy Integral Quality Monitoring (IQM) system, which provides exclusive verification of intrafractional treatment; developed with Mohammad Islam and Robert Heaton, which is now licensed to iRT

Among his many accolades, he has been named as Canada's Top 40 Under 40, an ASTRO Gold Medal winner, and the Fidani Chair in Radiation Physics. He has held over 50 peer-reviewed and industry grants as principal investigator valued at over \$70M, published over 260 peer-reviewed articles, and holds over 20 patents. As EVP of Technology and Innovation, he has led UHN's IT and digital transformation to new heights. His innovative and high impact contributions to our program will be greatly missed. RMP wishes him the best as he embarks on a new journey at M.D. Anderson Cancer Center in Houston, Texas to assume the role of Chief Technology and Digital Officer – Senior Vice President.



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RMP Research Committee
RMP Steering Committee
Radiation Therapy Radiation Safety Committee

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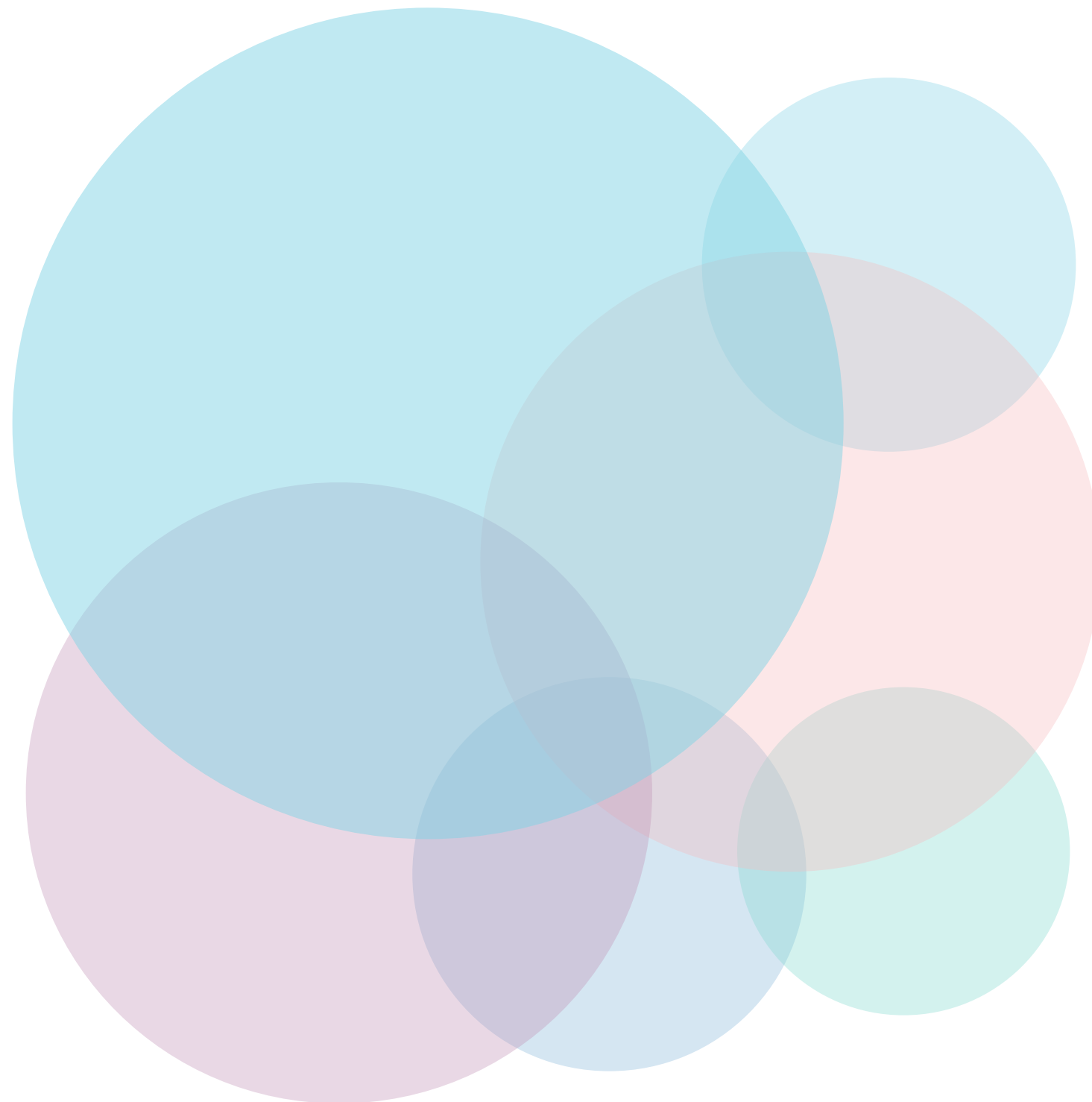
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Radiation Medicine Program

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